Improvements in Educational Preparedness for Quality and Safety

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Ongoing assessments of nurses' preparedness in quality and safety competencies are absent from prelicensure education programs. Yet acquiring knowledge and skills in these areas is critical for nurses to meet the recommendations of key health care stakeholders. The study presented in this article used a cross-sectional, comparative design to examine differences in reported preparedness between two cohorts of entry-level registered nurses licensed to practice in 2004–05 and 2007–08 across 15 U.S. states. The results showed that the 2007–08 cohort reported improvements ($p < .05$) in four items: evidence-based practice, data analysis, project implementation, and helpfulness of quality improvement training. These findings warrant continued assessments of quality and safety education in prelicensure nursing curricula to ensure optimal readiness of the nursing workforce.

Deficiencies in health care quality and safety in the United States highlighted more than a decade ago (Institute of Medicine [IOM], 1999, 2001) persist (Agency for Healthcare Research and Quality [AHRQ], 2012; Wachter, 2010), representing an increasing threat to the nation's economy and health (Berwick & Hackbarth, 2012). Redesigning basic educational competencies of all health care providers for health system improvements is essential for bridging the quality gap (IOM, 2003). Preparing registered nurses (RNs) is particularly important because they are the majority of the health care workforce and are ideally positioned to confront unrelenting quality problems (IOM, 2011).

The 2003 Institute of Medicine's (IOM's) report signaled the need to integrate quality and safety topics into health professions' curricula. Subsequently, several key initiatives were developed to bolster nursing students' preparedness. Quality and Safety Education for Nurses (QSEN) translated the IOM's (2003) recommendations into beginning competencies for prelicensure nursing students, including patient-centered care, teamwork and collaboration, evidence-based practice, quality improvement, safety, and informatics (Cronenwett et al., 2007). In 2007, a website was created to promote dissemination and implementation of QSEN educational resources (Quality and Safety Education for Nurses [QSEN], n.d.). Concurrently, QSEN's project lead team worked with 15 pilot schools to generate ideas for effective teaching and learning of QSEN competencies (Cronenwett, Sherwood, & Gelman, 2009). In 2008, the Institute for Healthcare Improvement's (IHI's) Open School for Health Professions was launched, offering free access to Web-based modules for quality improvement (QI) and patient safety for all health profession students (Institute for Healthcare Improvement, 2013). In 2009, as part of the Retooling for Quality and Safety Initiative, the Josiah Macy Jr. Foundation and the IHI funded six medical and nursing schools to integrate QI and patient safety into their curricula (Headrick et al., 2012). In 2010, the American Association of Colleges of Nursing (AACN) and the University of North Carolina School of Nursing in Chapel Hill partnered in Phase III of the QSEN project to implement a "train-the-trainer" series of workshops to enhance the capacity of 1,200 faculty members to teach quality and safety concepts (QSEN, n.d.).

Nursing education accrediting groups recognize that improving quality and safety of patient care demands that new nurses be academically prepared. The Commission on Collegiate Nursing Education (2009) and the National League for Nursing (2009) updated accreditation standards in 2008 to more clearly emphasize quality and safety. Also, the AACN's *The Essentials of Baccalaureate Education for Professional Nursing Practice* outlined the expectation that baccalaureate nursing program graduates have "knowledge and skills in leadership, quality improvement, and patient safety" (American Association of Colleges of Nursing, 2008, p. 3).

Given the many initiatives aimed at better preparing RNs for quality and safety practice, educational progress must be systematically and periodically monitored, and educational system changes must be made as necessary. The National Council of State Boards of Nursing (NCSBN, 2012) conducts practice assessments of newly licensed RNs on a 3-year cycle to monitor changes in practice and adjust licensing exams accordingly. However, similar assessments for educational preparedness specific to quality and safety are not available. Some assessments of preparedness in QSEN topics exist (Kovner, Brewer, Yingrengreung, & Fairchild, 2010; Smith, Cronenwett, & Sherwood, 2007; Sullivan, Hirst,

& Cronenwett, 2009), but the authors could not find any studies that assess changes in quality and safety preparedness over time. There is evidence that some schools are integrating QSEN content into their curricula (Cronenwett et al., 2007; Headrick et al., 2012), but it is difficult to gauge from this evidence how well nurse graduates across the country are educated in quality and safety. In comparison to a larger study in which the authors examined QI participation and educational preparedness by employers (Djukic, Kovner, Brewer, Fatehi, & Seltzer, 2013), the study presented here set out to answer the specific research question: Does the reported level of preparedness in quality and safety by prelicensure nursing programs differ between two RN cohorts who obtained their initial license to practice 3 years apart?

The authors hypothesized that 2007–08 licensees (cohort 2) were more likely to report greater preparedness across all measured survey items than 2004–05 licensees (cohort 1) because cohort 2 RNs attended prelicensure nursing programs that had more time to integrate quality and safety content. This article presents this study, its results and implications for redesign of quality and safety curricula.

Methods and Study Sample

The authors obtained approvals from their institutional review boards to conduct the study and used a cross-sectional, descriptive, comparative design and data from various sources. To assess changes over time, the authors surveyed two cohorts of RNs in the same 15 states (Alabama, Kentucky, Maryland, Michigan, Nevada, New Jersey, New York, North Carolina, Oklahoma, Oregon, Pennsylvania, South Carolina, Tennessee, Texas, West Virginia). The authors chose these states because they had the most accessible and accurate lists of new RNs.

Cohort 1 was a subsample of participants in an ongoing panel study that tracks work patterns of newly licensed RNs (Kovner et al., 2007). In the panel study, a newly licensed RN survey is being administered six times from 2006 to 2015 to a cohort of RNs first licensed to practice between August 1, 2004, and July 31, 2005, in 34 states and the District of Columbia to assess their personal characteristics, work environment, and employment characteristics. From the RNs in the panel study who responded to the Year 2 survey (N = 2,398; 71% response rate), the authors identified the 1,694 RNs who worked in hospitals. From 1,694, the authors randomly selected 730 RNs and invited them to participate in a survey designed to assess their educational preparedness and participation in quality and safety (QI survey), which was administered between October 2008 and January 2009 (Kovner et al., 2010). Of the 730 RNs, 456 completed the survey (72% response rate), and 3 were excluded for reporting more than 100 hours of training in QI over 12 months. Of the remaining 453, the authors selected all (N = 117) who, based on their home zip code, resided in 25 metropolitan statistical areas (MSAs) and 2 rural areas in 15 states to match them with cohort 2 subjects who resided in the same areas.

Cohort 2 was a sample of nurses who obtained their first license to practice between August 1, 2007, and July 31, 2008, participated in the ongoing panel study between January and March 2009, and resided in the same 25 MSAs and 2 rural counties (Brewer, Kovner, Yingrengreung, & Djukic, 2012). Of the 3,216 newly licensed RN surveys sent in 2009, 1,765 were completed (57% response rate) and 1,496 were completed by the RNs working in hospitals. From this group, the authors randomly selected 1,113 RNs who took the QI survey between October 2010 and February 2011. Of those, 475 returned the survey (47% response rate), and 51 were excluded, six for reporting more than 100 hours of training in QI over 12 months, 32 for not reporting their work setting, and 13 for reporting they work outside of a hospital. This left 424 respondents in cohort 2.

All response rates were calculated according to American Association of Public Opinion Research standards, using response rate #3 formula (American Association for Public Opinion Research, 2004).

Data Collection

For cohort 1, all data for marital status, first basic degree, and ethnicity came from the newly licensed RN survey administered in January 2006 (Kovner et al., 2007). The data on quality and safety educational preparedness, age, gender, work status, work setting, unit type, position/job title, and Magnet® hospital status came from the QI survey administered in October 2008 (Kovner et al., 2010).

For cohort 2, data for marital status, first basic degree, and ethnicity came from the newly licensed RN survey administered in January 2009 (Brewer et al., 2012). Data on quality and safety educational preparedness, age, gender, work status, work setting, unit type, position/job title, and Magnet hospital status came from the QI survey administered in October 2010.

A mixed-mode mailed paper and Web-based survey was used. The approach for surveys was to use multiple mailings to nonresponders following the Dillman Tailored Design method with a $5 cash incentive (Dillman, 2000). The authors sent an alert letter, a survey with a $5 incentive, a reminder postcard, another mailed survey, and finally a mailed survey by U.S. Postal Service second-day express mail. Responders with a known e-mail address were sent the alert letter with the $5 incentive via regular mail; the other correspondence was e-mailed. The final mailing for all nonrespondents was sent via Priority mail.

Survey Instrument

The two cohorts received an identical QI survey containing 35 questions and a total of 95 items, 12 of which assess demographic and work-setting characteristics. This article reports on 35 items

that assess the level of RNs' preparedness in QI and patient safety topics by their prelicensure nursing education programs. Additional items include 14 related to hours of training in QI provided by current employers; 8 about employer-sponsored QI training opportunities, effectiveness, and barriers; 12 related to administrative support for QI; and 14 related to RN participation in QI activities at work.

In terms of validity and reliability, Djukic, Kovner, Brewer, et al., 2012 explained:

> No scales are included in the QI survey and, therefore, reliability analysis has not been performed on the single items that are part of the survey. The research team developed specific questions based on the QSEN's work (Cronenwett et al., 2007) and in consultation with an expert panel. The content validity for the specific questions about QI was established in a review by a five-member expert panel. The draft survey was pilot tested on five hospital staff RNs, and changes were made on the basis of staff RNs' comments to improve the usability of the survey. (p. 4)

Data Analysis

To examine differences between cohorts, the authors used Fisher's exact chi-square test for categorical variables and independent sample t-tests for noncategorical variables. Each variable was compared individually between the two cohorts. The authors interpreted *p* values of less than .05 as indicating statistically significant differences. For variables with a significant omnibus chi-square test, the authors conducted post hoc analysis, using Bonferroni correction to detect for which specific cells the comparisons were significant. Based on the total sample size for the two cohorts (N = 541), the authors had 80% power to detect small effect size between cohort comparisons.

Results

There were no differences ($p < .05$) between cohort 1 and cohort 2 on the following variables: age, marital status, first basic nursing degree, ethnicity, work setting, unit type, and working at a Magnet hospital. The mean age for cohort 1 was 36.1 (SD = 10.0) and for cohort 2, 34.4 (SD = 9.0). The respondents from both cohorts were mainly White (cohort 1 = 81.3%, cohort 2 = 80.1%), about half were married (cohort 1 = 55.7%, cohort 2 = 52.9%), and more than half had a diploma or an associate degree as their first basic nursing degree (cohort 1 = 60.9%, cohort 2 = 58.6%). They mostly worked full time (cohort 1 = 88.7%, cohort 2 = 92.5%), in an inpatient hospital setting (cohort 1 = 93.9%, cohort 2 = 93.4%), in non-Magnet hospitals (cohort 1 = 80.2%, cohort 2 =81.4%). About a third worked on medical-surgical units (cohort 1 = 31.3%, cohort 2 = 35.9%). Cohort 1 had more male RNs (16.7%) than cohort 2 (6.8%) (p = .003) and more RNs in head/assistant manager positions (13%) than cohort 2 (4.2%) (p = .000). Further, cohort 1 respondents had an opportunity to work for an average of 42.5 months after passing NCLEX-RN® (SD = 3.8), which was significantly more than the average of 30.3 months (SD = 3.8) for cohort 2.

As presented in Tables 1 and 2, significant differences were found between the two cohorts for three variables: evidence-based practice, data analysis, and project implementation. The results of the post hoc analysis are summarized below.

- A higher percentage of cohort 2 RNs reported being *very* prepared (95.6%) versus being *not at all* prepared (4.4%) compared with cohort 1 RNs who reported being *very* prepared (83.9%) versus *not at all* prepared (16.1%) in evidence-based practice (p = .012).
- A higher percentage of cohort 2 RNs reported being *very* prepared (59.3%) versus *somewhat* prepared (40.7%) compared with cohort 1 RNs who reported being *very* prepared (44.8%) versus *somewhat* prepared (55.2%) in evidence-based practice (p = .024).
- A higher percentage of cohort 2 RNs reported being *very* prepared (37.9%) versus *somewhat* prepared (62.1%) compared with cohort 1 RNs who reported being *very* prepared (20.9%) versus *somewhat* prepared (79.1%) in data analysis (p = .009).
- A higher percentage of cohort 2 RNs reported being *very* prepared (45.3%) versus being *not at all* prepared (54.7%) compared with cohort 1 RNs who reported being *very* prepared (26.7%) versus *not at all* prepared (73.3%) in project implementation (p = .03).

Additionally, a higher percentage of cohort 2 RNs reported that training they had in QI was very helpful (92.8%) versus not very helpful (7.2%) compared with cohort 1 RNs who reported that training was very helpful (63.2%) versus not very helpful (36.8%) to their job (p = .000). On the other hand, a higher percentage of cohort 2 RNs reported that training they had in QI was not at all helpful (85.6%) versus not very helpful (14.4%) compared with cohort 1 RNs who reported that training was not at all helpful (17.6%) versus not very helpful (82.4%) to their job (p = .000).

Regarding how well or poorly a basic nursing education program prepared them to use QI processes, such as PDSA (Plan, Do, Study, Act) cycles, six sigma techniques, or root cause analysis to improve the quality of care in their job, no difference (p = .719) was found between cohort 1 (11.0% have never heard of QI process; 7.3% reported being very poorly, 19.3% poorly, 56.0% reasonably well, and 6.4% very well prepared) and cohort 2 (13.9% have never heard of QI process; 7.8% reported being very poorly, 20.3% poorly, 48.7% reasonably well, and 9.3% very well prepared). Also, no difference (p = .510) was found for preparedness in preventing nosocomial infections between cohort 1 (0.9% reported being very poorly, 4.3% poorly, 53.9% reasonably well, and 40.9% very well prepared) and cohort 2 (0.9% reported being very poorly, 2.1% poorly, 52.8% reasonably well, and 44.1% very well prepared).

TABLE 1

Comparison of Quality and Safety Education Items Reported by Cohort 1 (*N* = 117) and Cohort 2 (*N* = 424)

Variable[a]	Cohort 1 *n* (%)		Cohort 2 *n* (%)		*p*
	Very prepared	*Other*[b]	*Very prepared*	*Other*[b]	
Patient-centered care	59 (51.3)	56 (48.7)	231 (55.9)	182 (44.1)	0.211
Teamwork and collaboration	45 (39.5)	69 (60.5)	183 (44.4)	229 (55.6)	0.389
Evidence-based practice	47 (41.2)	67 (58.8)	239 (57.7)	175 (42.3)	0.001
Safety	81 (71.1)	33 (29.0)	291 (70.8)	120 (29.2)	0.363
Standardized practices for restraint and seclusion	47 (41.2)	67 (58.7)	131 (31.6)	284 (68.4)	0.153
Standardized practices for infection control	68 (60.2)	45 (39.9)	240 (57.8)	175 (42.2)	0.930
Standardized practices for pain management	62 (53.9)	53 (46.0)	212 (51.1)	203 (48.9)	0.838
Using appropriate information technology or strategies to reduce reliance on memory (e.g., checklists, forcing functions, personal digital assistants)	24 (20.9)	91 (79.1)	108 (26.2)	305 (73.9)	0.496
Communicating concerns about hazards to patients and families	35 (30.7)	79 (69.3)	103 (25.0)	309 (75.0)	0.053
Communicating concerns about hazards to colleagues (team)	35 (30.4)	80 (69.5)	109 (26.5)	302 (73.5)	0.711
Using organizational error reporting systems for near-miss and error reporting	19 (16.5)	96 (83.5)	76 (18.4)	337 (81.6)	0.883
Participating in analyzing errors and designing system improvements	11 (9.6)	104 (90.5)	55 (13.5)	353 (86.5)	0.253
Using national patient safety resources, initiatives, or regulations, such as National Quality Forum or Institute for Healthcare Improvement, for professional development	16 (13.9)	99 (86.1)	86 (20.8)	327 (79.2)	0.050
Using national patient safety resources, initiatives, or regulations in local care settings	20 (17.5)	94 (82.4)	85 (20.6)	327 (79.4)	0.346
Engaging in root-cause analysis when errors or near misses occur	19 (16.7)	95 (83.3)	61 (14.7)	355 (85.3)	0.380

[a] The specific question asked: "How prepared or unprepared were you by your basic nursing program in the following quality improvement topics?"

[b] Category "Other" includes "not at all prepared" and "somewhat prepared." Categories were not collapsed during analysis, but are collapsed in the table.

Discussion

This study is the first to assess changes in prelicensure quality and safety education over 3 years (2004–05 to 2007–08) in a geographically diverse sample of RNs. It complements previous studies that assess quality and safety education from the point of view of school directors (Smith et al., 2007) and from students at 15 QSEN pilot sites, which focused intensely on incorporating QSEN competencies (Sullivan et al., 2009); therefore, those data might not be generalizable to students who did not attend the pilot schools. As noted, the current study found statistically significant improvements in only four areas. The authors think the lack of differences for the majority of the variables is an equally important finding, which indicates modest progress in educational preparedness for quality and safety. This finding warrants continuing assessments of entry-level RNs to monitor the integration of quality and safety into prelicensure nursing curricula.

Descriptive trends regarding the frequency with which both cohorts report preparedness across different topics suggest improvements are needed more in some areas than in others. For example, as shown in Table 1, the greatest percentage of RNs from both cohorts reported being very prepared in safety, and the smallest percentage reported being very prepared in analyzing errors and designing system improvements. Similar to the findings of Sullivan et al. (2009), more respondents reported being very prepared in patient-centered care and safety compared with teamwork and collaboration. The results from Table 2 show that only about 10% of RNs from both cohorts reported being very prepared in using recognized QI models. Additionally, less than a quarter of RNs from both cohorts reported being very prepared in QI processes, such as assessing gaps in practice, flowcharting, applying QI tools and methods to assess performance, doing repeated small tests of change, and monitoring sustainability of improvement efforts.

TABLE 2

Comparison of Reported Preparedness in QI Models and Processes Between Two RN Cohorts Licensed to Practice 3 Years Apart (N_1 = 117; N_2 = 424)

Variable[a]	Cohort 1 *n* (%)		Cohort 2 *n* (%)		*p*
	Very prepared	*Other*[b]	*Very prepared*	*Other*[b]	
Models					
Using FADE QI model	10 (9.1)	100 (90.9)	45 (11.1)	361 (88.9)	0.559
Using Plan-Do-Study-Act QI model	14 (13.0)	94 (87.0)	46 (11.3)	362 (88.7)	0.674
Using Six Sigma-DMAIC/DMADV QI model	8 (7.4)	100 (92.6)	27 (6.7)	377 (93.3)	0.120
Using Continuous Quality Improvement QI model	10 (9.2)	99 (90.8)	49 (12.2)	354 (87.8)	0.661
Using Total Quality Management QI model	8 (7.3)	101 (92.6)	39 (9.7)	365 (90.4)	0.492
Processes					
Data collection	26 (23.4)	85 (76.6)	137 (33.2)	276 (66.8)	0.081
Data analysis	18 (16.2)	93 (83.8)	120 (29.2)	291 (70.8)	0.011
Measurement	21 (18.9)	90 (81.1)	112 (27.4)	297 (72.6)	0.122
Project implementation	16 (14.5)	74 (85.5)	96 (23.5)	313 (76.6)	0.029
Using QI data analysis or project monitoring tools	10 (9.0)	101 (90.9)	63 (15.5)	344 (84.5)	0.221
Flowcharting processes	19 (17.1)	92 (82.8)	93 (22.5)	320 (77.4)	0.432
Measuring current performance	15 (13.5)	96 (86.5)	82 (20.1)	326 (79.9)	0.298
Assessing gaps in current practice	8 (7.2)	103 (92.7)	61 (15.0)	346 (85.0)	0.064
Systematically applying tools and methods to improve performance	17 (15.3)	94 (84.6)	77 (18.8)	333 (81.2)	0.483
Measuring resulting changes	14 (12.6)	97 (87.3)	68 (16.7)	340 (83.3)	0.569
Repeating measurement, assessment, applications of tools for improvement, and measurement of resulting changes until desired performance is achieved	10 (9.1)	100 (90.9)	57 (13.9)	352 (86.1)	0.080
Monitoring sustainability	10 (9.2)	99 (90.8)	47 (11.5)	361 (88.5)	0.237

Note. QI = quality improvement; RN = registered nurse.

[a] The specific question asked: "How prepared or unprepared were you by your basic nursing program in the following quality improvement topics?"

[b] Category "Other" includes "not at all prepared" and "somewhat prepared." Categories were not collapsed during analysis, but are collapsed in the table.

Limitations

The study has several limitations. The timing of data collection may not have been optimal to detect the impact of several initiatives aimed at integrating quality and safety topics into nursing programs that started or were more fully established after the cohort 2 RNs graduated. However, some of the initiatives targeted and provided financial support to a relatively few schools (Headrick et al., 2012), so their influence on a wider number of programs cannot be identified without additional assessments of a nationally representative sample of RN graduates. As for internal validity, the survey comprised single-item quality and safety measures, which may be less reliable than multi-item scales. The absence of multi-item measures warrants further research. The study findings should be generalized cautiously to RN graduates outside the 15 states involved, although the authors have no reason to believe graduates from other states are substantially different.

The samples differed significantly in three ways: Cohort 1 had more nurses in management positions, nurses with about a year more work experience, and more nurses who were male. The authors do not expect differences in gender to influence reports of quality and safety preparedness, nor do they expect work characteristics, such as management and work experience, to be related to how nurses think they were prepared in quality and safety in prelicensure programs. Even if these work characteristics could influence perceptions of prelicensure education, that does not seem to be the case in the present study: Cohort 1, which had nurses with more work and management experience, reported being less prepared across all measured variables.

Recall bias is another limitation. We asked cohort 2 respondents to rate their educational experience about 2.5 years

after passing NCLEX-RN and cohort 1 respondents to rate their educational experience about 3.5 years after passing NCLEX-RN. Respondents may not remember precisely the education on quality and safety they received in prelicensure nursing programs. Also, the study design cannot determine the potential influences of work-related quality and safety training and participation on the respondents' perceptions of prelicensure education. These limitations are balanced with the strengths of the study, which include samples of RN graduates from a geographically diverse area who were demographically similar, suggesting that differences in their reported preparedness in quality and safety were not likely influenced by differences in their personal or work characteristics.

Implications

NCSBNs main goal is to protect the public by ensuring that RNs entering the workforce have the necessary skills and knowledge to practice nursing. One way to meet that goal is through its evidence-based regulatory model, Transition to Practice, which has been developed as a collaborative model among education, practice, and regulation to ensure that entry-level RNs acquire essential quality and safety competencies through a preceptorship and Web-based education (Spector & Echternacht, 2010). The findings from the present study provide the evidence that such programs are needed to ensure the nursing workforce is well prepared to meet the national priorities for high quality and safe health care.

Producing safe entry-level RN practitioners requires best practices in nursing education for quality and safety. Though baccalaureate-program graduates report better preparedness in some of the QI and patient safety topics than associate-degree graduates (Kovner et al., 2010), all prelicensure nursing programs must strengthen their curricula to produce influential improvements in the overall RN workforce's readiness for health system improvements. Nursing schools should take advantage of the many available programs and resources to build their faculty's capacity to teach QSEN competencies and to build a QI-ready workforce. For example, faculty members can attend QI workshops sponsored by the AACN and QSEN, so they can become QSEN champions leading curricular revisions. The schools can also bring in QI educational consultants affiliated with QSEN to provide on-site development. Incorporating free and easily accessible Web-based resources such as IHI's (2013) modules into undergraduate curricula is another strategy for strengthening quality and safety education. The authors hope that the findings of this study will inspire programs across the country to build their capacity for quality and safety education.

Conducting periodic assessments of newly licensed RNs regarding their quality and safety educational experiences at a national level, similar to the practice assessments conducted every 3 years by the NCSBN (2012), is critically important to monitor the progress of entry-level RNs' educational preparedness for the competencies outlined by QSEN (Cronenwett et al., 2007). Additionally, future research should examine relationships among nurses' preparedness in quality and safety by schools and employers, their participation in QI at work, and patient outcomes.

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